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AUTHOR DeVore, Paul W.
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ABSTRACT

The background and objectives of the 1985-1986 Transportation Education Project of the Urban Mass Transportation Agency (UMTA) are discussed, along with project activities. The project was undertaken to transfer knowledge gained from federally-sponsored research and demonstrations to transit systems and to include the knowledge in college courses that deal with public transportation. In 1983 UMTA funded West Virginia University to develop instructional modules based on UMTA innovations in three areas: paratransit, market segmentation planning, and transportation brokerage. The modules are flexible and concept-based and were developed through extensive reviews and field tests by transportation educators and experts. Appendices include: a list of field reviewers and field tests of instructional modules and reviewers of the diffusion/adoption plan, a module field review questionnaire, a module field test questionnaire, a list of conferences and presentations by the project team in developing the diffusion/adoption plan, and the field review questionnaire for the plan. (SW)

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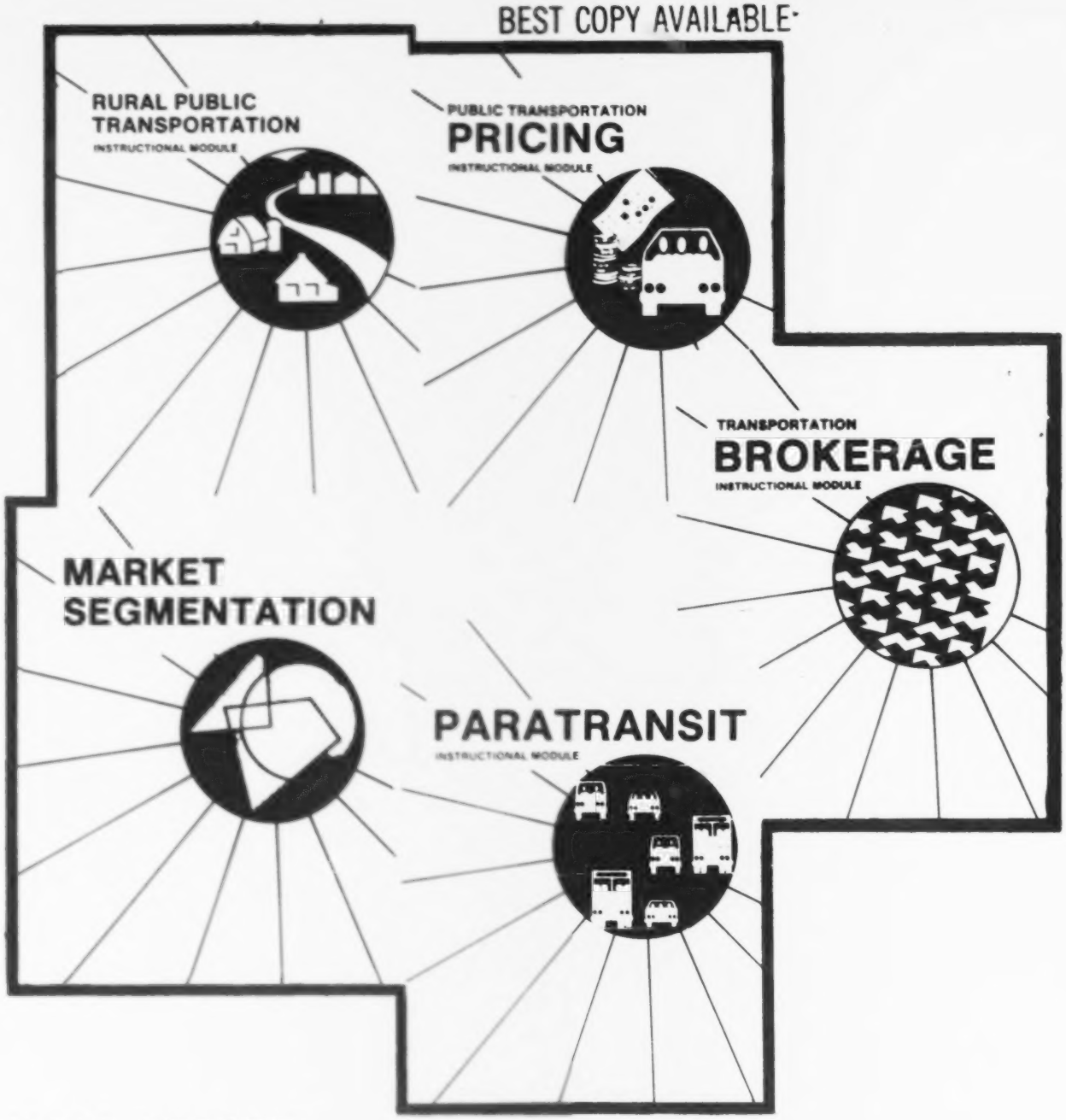

FINAL REPORT

Design and Development of Instructional Modules for Undergraduate Transportation Education and Development and Evaluation of Diffusion and Adoption Plan

January 1986

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Design and Development of Instructional Modules for Transportation Education and Development and Evaluation of Diffusion/Adoption Plan

Funded By:
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Final Report: November 1986

Submitted by:
Paul W. DeVore
Principal Investigator

ACKNOWLEDGMENTS

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We also gratefully acknowledge those transportation professors, and others, who assisted our project as field reviewers and testers of the instructional modules and as reviewers of the draft diffusion/adoption plan. These individuals are listed in Appendix A and B.

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FINAL REPORT:

DESIGN AND DEVELOPMENT OF INSTRUCTIONAL MODULES

FOR TRANSPORTATION EDUCATION

AND

DEVELOPMENT AND EVALUATION OF

DIFFUSION AND ADOPTION PLAN

Part 1 - Project Background and Objectives

Background of 1985-6 Project

In 1974 UMTA created the Service and Methods Demonstration (SMD) Program (now under the Office of Service and Management Demonstrations) to promote the development and widespread adoption of innovative transit services and efficient transit management techniques. The SMD program has developed new techniques and lessons in many areas including bus and rail equipment design, automation, paratransit, rural transportation, and coordinated transportation planning.

In the late 1970's UMTA became interested in the question of how to transfer the knowledge gained from their federally-sponsored research and demonstrations. This concern lead to an interest in the means by which UMTA might facilitate the process by which transit systems adopted SMD-developed management and operating improvements. After research and pilot projects, UMTA developed a Public Transportation Network of resource contacts, regional facilitators and developer demonstrators to promote the use of previously demonstrated service and management innovations by the transit

industry.

UMTA also became interested in spreading the knowledge gained from SMD demonstrations to future transportation professionals during their formal education. The availability of SMD reports in Washington appeared to have little effect on the traditional college and university courses which dealt with public transportation, thus many graduates of these programs remained unaware of the significant and exciting changes occurring in the management of public transportation systems.

In 1983 UMTA funded the Department of Technology Education at West Virginia University to undertake a Transportation Education Project to develop instructional modules based on UMTA/SMD innovations in three areas: paratransit, market segmentation planning, and transportation brokerage.

To facilitate their use in a variety of transportation courses the modules were designed to be flexible, concept-based introductions to the topics with illustrations and an organization which permitted easy reproduction and use of all, or part of, each unit. These modules were developed with the aid of extensive reviews and field tests by transportation educators and other experts. (For more information on this phase of the Transportation Education Project see Report Number WV-11-003).

Objectives of the 1985-6 Project

In the original proposal for the 1985-6 Transportation Education Project there were two major objectives:

1. design and develop two instructional modules for use in graduate and undergraduate transportation education courses; and
2. formulate, revise and complete a specific plan for the diffusion and adoption of the instructional modules by transportation educators.

In addition, a third objective was agreed to by members of the project team and UMTA/SMD staff members:

3. revise, update, and re-edit the three modules produced in 1983 in light of further demonstration results and related knowledge.

PART 2 - ACTIVITIES OF 1985-6 PROJECT

Design and Development of Two New Instructional Modules

Selection of Content and Topics

The topics of the two new instructional modules were selected after consultation between the project staff and UMTA. The topics selected included content areas to which UMTA/SMD research had made major and recent contributions and which would be of value to future transportation professionals during their formal education. The two new topics selected were public transportation pricing and rural public transportation.

1983 Design Criteria for Instructional Modules

Eight criteria were developed in 1983 for use in the design and external evaluations of the modules. The instructional modules were designed to:

1. fit a cross-section of existing courses;
2. be adaptable to varied class schedules;
3. be concept-oriented;
4. ensure low-cost reproduction and use;
5. be designed for use by faculty;
6. allow for effective use by professors unfamiliar with the content of the modules;
7. be self-contained teaching units; and
8. stimulate interest in new transportation methods.

To meet these criteria it was decided that the modules would be printed on 8 by 11 paper in black and white and three-hole punched.

This format facilitated low-cost reproduction of text and graphics, flexibility of use, and adaptability.

Reevaluation of Design Criteria

In January 1985 the project team conducted a major evaluation of the utility of the 1983 design criteria and format decisions. This evaluation included consideration of the following data:

- all completed questionnaires from reviews and field tests of the modules;
- consultations with UMTA/SMD staff about the 1983 modules;
- comments of external module users; and
- an internal reassessment of the 1983 modules.

It was concluded that the 1983 design criteria were relevant and useful and that the basic format of the modules was the best available means of meeting the design criteria.

The text and graphics of the 1983 modules were also evaluated using the same sources of information. The concept-based texts of the 1983 modules were evaluated as quite strong. There was a need only for slight updating. In addition, it was concluded that the methods used to develop the 1983 modules were still appropriate.

The graphics of the 1983 modules were evaluated and reactions were mixed. Some of the illustrations designed for use with overhead projectors were not easy to read using this media. In addition, the simple academic-style covers were judged to need more graphic excitement to increase the appeal of the units. It was decided to devote greater time and effort to improving the graphics of the modules. It was also decided to use heavyweight two-color covers with a consistent graphic theme.

Module Development Process

The five instructional modules were developed using the following procedures:

1. Analysis of UMTA-developed materials and, in conjunction with UMTA, selection of content best suited for redesign and inclusion into diffusable instructional modules.

In January 1985 two new module topics were selected: Public Transportation Pricing and Rural Public Transportation.

2. Analysis of topics, and the relevance of UMTA research, and the production of draft instructional unit.

This phase required extensive time researching, analyzing, and synthesizing UMTA-developed and other research documents into units which met the criteria for facilitating their adoption by transportation educators.

3. Reviews of module draft by selected content experts and transportation educators.

A Field Review Questionnaire (Appendix C) was developed and sent with the first draft of each individual module, without illustrations, in June 1985 to selected persons with expertise in the topic area. While most reviewers were transportation professors others such as system operators, consultants, members of non-profit organizations, and state employees were also involved. Each of the new modules was reviewed by seven content experts. Many of the reviewers at the first draft stage also assisted by writing comments directly on the draft copy. This input from a variety of experts was critical in the development of accurate, usable, and acceptable materials.

4. Revision of drafts of each module based on external reviews and preparation of finished modules.

5. Classroom field testing and evaluation of modules by college and university transportation educators.

In September 1985 each professor who volunteered to field test the modules was provided with a draft copy (with illustrations) of a particular module, a Field Test Questionnaire (Appendix D), and a letter requesting that the module be utilized for one hour or more in a graduate or undergraduate course with transportation-related content. The Pricing module was field tested in four classrooms and the Rural module in five. A list of all 1985-6 field reviewers and field testers is included as Appendix A.

6. Preparation and submission of camera-ready copy of completed modules.

Camera-ready copies of the final instructional modules were delivered to UMTA in Februrary 1986 and printed copies were received from UMTA by the project team in late April 1986.

Revision and Updating of Three Existing Instructional Modules

The process of revising and updating the three existing instrucitonal modules was performed parallel to the development of the two new modules.

Existing Module Revision Process

The three existing instructional modules were revised following a major evaluation in January 1985 (see page 5) of the utility of the 1983 design criteria and format decisions. The following procedures were used in revising the modules:

1. Review of module draft by selected content experts and transportation educators.

   In January 1986, Paul W. DeVore and Peter Wright presented a request at the Annual Meeting of the Education Committee of the Transportation Research Board. The request asked that members of the committee assist the project by reviewing the three existing modules. Members of the committee agreed to assist the project. Fourteen reviews were received from members of the committee. Most of these reviewers were transportation professors. This input from transportation education experts was critical in the revision of the units. A list of all 1985-6 reviewers and field testers is included as Appendix A.

2. Review of UMTA-developed materials and selection of content of recent research most appropriate for inclusion into existing instructional modules.

3. Analysis of topics, and relevance of UMTA research, and production of draft revised instructional units.

This phase required extensive time researching, analyzing, and synthesizing UMTA-developed and other research documents into existing units.

4. Preparation and submission of camera-ready copy of completed modules.

Camera-ready copies of the final three revised instructional modules were delivered to UMTA in Februrary 1986 and printed copies were received from UMTA by the project team in late April 1986.

Design and Development of Diffusion/Adoption Plan

Goal of the Diffusion/Adoption Plan

The UMTA/WVU Diffusion/Adoption Plan was designed to diffuse instructional modules based on UMTA/SMD-sponsored research and demonstrations to transportation educators for use in the preparation of future transportation professionals. The plan was not designed to diffuse a new method of education but rather new content concerning public transportation. UMTA research has shown that, ideally, public transportation provides mobility to people through a variety of modes, operators, and contractual arrangements.

Objective of the Diffusion/Adoption Plan

The diffusion/adoption plan was designed to permit any chosen change agent to appropriately and cost-effectively motivate transportaton educators to order, and utilize the UMTA/WVU instructional modules.

Phases of the Diffusion/Adoption Plan

The diffusion/adoption plan has four distinct phases:

1. Development of instructional modules based on the content to be diffused.
2. Promotion of the diffusion of the modules to transportation educators.
3. Promotion of the use and adoption of the modules.
4. Evaluation and revision of the diffusion/adoption plan.

The completion of Phase 1 was discussed earlier in this report. The attached diffusion/adoption plan includes the specific steps necessary to complete Phases 2, 3, and 4.

Bases for the Diffusion/Adoption Plan

The plan was developed on the basis of the following resources and research:

1. Research into processes of diffusion and adoption.
2. Investigation and trial of various tactics selected for the promotion of the awareness and use of these modules.
3. Direct contact over two years with transportation educators during the development and revision of the instructional modules.
4. Direct contact with transportation educators and others in the development, testing and revision of the diffusion/adoption plan.
5. Experience of team members in related transportation education efforts.

Plan Development Assumptions

1. The transfer of UMTA/SMD-developed knowledge to future transportation professionals during their formal education is very important.

2. Carefully designed and targeted diffusion/adoption plans are more cost-effective than generalized approaches.

3. Diffusion research is critical in the design of successful diffusion/adoption plans.

4. Technology transfer is a complex, human, non-technical, process which requires careful planning and a flexible, feedback-oriented implementation process if it is to be effective.

5. An effective time to communicate up-to-date research-based concepts to future transportation professionals is during their formal education.

Criteria for Selection of Methods Used in the UMTA Diffusion/Adoption Plan

To be utilized in the implementation of the diffusion/adoption plan's overall strategy, specific diffusion methods had to:

- o contribute directly to the objective of the diffusion/adoption plan;
- o be cost-effective;
- o be consistent with diffusion research and transportation educator characteristics;
- o permit implementation by change agents not already associated with the transprotation education project; and
- o be consistent with UMTA's role.

Diffusion/Adoption Plan Development Process

The diffusion/adoption plan was developed using the following procedures:

1. Gather and analyze information on diffusion/adoption processes, the characteristics of transportation educators, and the specific content to be transferred.

In January 1985 the project team began an extensive analysis designed to permit the development of an effective diffusion/adoption plan meeting the above goals, objectives, and criteria.

2. Analyze data, conduct nonformal field trials of various dissemination and adoption tactics, and produce draft diffusion/adoption plan.

This phase required extensive time researching, analyzing, and synthesizing research documents, project records, and the results of field efforts to:

- place free announcements in transportation related periodicals;
- attend conferences and promote module use informally;
- prepare academic papers about the Transportation Education project for publication in association journals;
- prepare and present the project both formally and informally at sessions of association conferences (A complete list of all presentations made and conferences attended is included as Appendix E); and
- promote module use by telephone calls to transportation educators.

3. Arrange for review of d/a plan draft by selected diffusion, transportation, and education experts.

A Field Review Questionnaire (Appendix F) was developed and sent with the draft of the diffusion/adoption plan in September 1985 to the five reviewers. (A list of diffusion/adoption plan reviewers appears as Appendix B). All of the reviewers at the first draft stage also assisted by writing comments directly on the draft copy. This input from a variety of experts was critical in the development of an accurate, usable, and acceptable plan.

4. Complete development of plan and appendices.

From July to November 1985 the project team designed and completed a specific flow chart of the plan actions, a sample brochure to use in implementing the plan, and a mailing list of over 500 transportation educators with potential interest in the module content.

5. Prepare and submit final copies of d/a plan.

Final printed copies of the diffusion/adoption plan were delivered to UMTA in June 1986 by the Transportation Education Project staff.

Appendix A

1985-6 Field Reviewers and Field Testers
of UMTA/WVU Transportation Education Project
Instructional Modules

1985-6 Field Reviewers and Field Testers
Of UMTA/WVU Transportation Education Project
Instructional Modules

Paratransit

Field Reviewers

Arun Chatterjee and students
University of Tennessee

James Reading, T. Jones, W. Kelly, and R. Carmichael
COTA, Columbus, Ohio

David P. Middendorf
Michael S. Bronzini
University of Tennessee

C. S. Papacostas
University of Hawaii

Andrew Farkas
Morgan State University

Jotin Khisty
University of Washington

Transportation Brokerage

Field Reviewers

Abayomi Ajayi-Majebe
Ohio State Universtiy

James H. Miller
Penn State University

Peter Shaw
California State University - Long Beach

Market Segmentation

Field Reviewers

George Smerk
Institute for Urban Transportation, IN

James Reading
Jim Ahlstrom
COTA, Columbus, OH

Field Tester

John Collura
University of Massachusetts

Field Reviewer (Cont.)

James H. Miller
Penn State University

Public Transportation Pricing

Field Reviewers

Richard P. Guenthner
Marquette University

Robert Cervero
University of California - Berkeley

Gordon "Pete" Fielding
University of California - Irvine

Katie Dorsett
North Carolina A & T

Sue Knapp
Ecosometrics, Bethesda, MD

Field Testers

Zoltan Nemeth
Ohio State University

Larry Cooper
Texas Southern University

William Pollard
University of Colorado

Shinya Kikuchi
University of Delaware

Field Reviewer (cont.)

Lester Hoel
University of Virginia

Rural Public Transportation

Field Reviewers

Patricia Weaver
University of Kansas

Sheldon Edner
Portland State University

Edmund Jansen
University of New Hampshire

Susan O'Connell
WV Transportation Division

Barbara Price
Rural America, Inc.

Randy Isaacs
National Association for Transportation Alternatives

C. Michael Walton, chair, and members
TRB Committee on Transportation Planning Needs and Requirements of Small and Medium-Sized Communities

Field Testers

Anthony Schwaller
St. Cloud State University, MN

Charles Dare
University of Missouri - Rolla

Alice Kidder
Babson College, MA

Shinya Kikuchi
University of Delaware

Arland Hicks
University of Kansas

Appendix B

Reviewers of Diffusion/Adoption Plan

Reviewers of Diffusion/Adoption Plan

Dr. Everett Rogers, The University of Southern California

Dr. Edward Beimborn, The University of Wisconsin - Milwaukee

Dr. David Crandall, The NETWORK, Inc., Andover, Mass.

Dr. Kay Magill, Pacific Bell Directory, San Fransisco

Dr. James H. Miller, The Pennsylvania State University,
Public Transportation Network

Appendix C

Module Field Review Questionnaire

FIELD REVIEW EVALUATION

A. Please circle the number expressing your agreement or disagreement and comment where appropriate.

		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	In general I find this module interesting.	1	2	3	4	5
2.	The objectives of each section are clear.	1	2	3	4	5
3.	The section objectives are generally met. Comments?	1	2	3	4	5
4.	Topics are presented in a logical sequence. Comments?	1	2	3	4	5
5.	The information in the module is accurate. Comments?	1	2	3	4	5
6.	The key terms and concepts are adequately defined. Comments?	1	2	3	4	5
7.	Topics are discussed clearly. Comments?	1	2	3	4	5
8.	The module is too difficult for my students. Comments?	1	2	3	4	5
9.	The module is too easy for my students. Comments?	1	2	3	4	5

		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
10.	The module is consistent with my students' educational background. Comments?	1	2	3	4	5
11.	The module is relevant to my students' information needs. Comments?	1	2	3	4	5
12.	The module is relevant to the courses I teach. Comments?	1	2	3	4	5
3.	The module is too long to teach in three class periods. Comments?	1	2	3	4	5
14.	The module is too short to teach for three class periods. Comments?	1	2	3	4	5
15.	The level of detail is appropriate. Comments?	1	2	3	4	5
16.	The module restricts my teaching style. Comments?	1	2	3	4	5
17.	The module is visually appealing. Comments?	1	2	3	4	5

B. Does this module meet the following original project criteria? Please check boxes at right and comment below.

Transportation Module Criteria

The modules will:

	YES	UNDECIDED	NO
1. Fit a cross-section of existing undergraduate courses.			
2. Be adaptable to varied class schedules.			
3. Be concept-oriented.			
4. Ensure low-cost reproduction and use.			
5. Be designed for use by faculty.			
6. Allow for effective use by teachers unfamiliar with module content.			
7. Be self-contained teaching units.			
8. Stimulate interest in new transportation methods.			

COMMENTS.

C. Please respond to the following questions. Feel free to attach additional sheets if desired.

1. Is the module relevant to the content of the courses you teach?

2. How could the module be modified to make it more compatible with the courses you teach?

3. What information is not in the module which should be included?

4. What information currently included in the module should be omitted?

5. How well does the professor's introduction prepare you to use the module? Should any information be added or deleted?

6. What would you tell a colleague who planned to use this module?

7. What do you like or dislike about the format of the module text?

8-10. How well does the general introduction lead in to this module? Should any information be added or deleted?

11. Were any of the questions ambiguous? (Please list their numbers.)

12. Please summarize your overall reaction to this module.

Appendix D

Module Field Test Questionnaire

FIELD TEST QUESTIONNAIRE

A. Please complete background information on the course in which you field tested the module.

Course title_____

Department_____

Level_____

Class length (1 hr, etc.)_____

Student rank (jrs., grads., etc.)_____

Student majors (Engineering, Marketing,etc.)_____

Number of class periods devoted to module_____

B. Please respond to the following questions based on experiences during the field test.

1. What method(s) did you use to present the module material to students? (Check all that apply)

Lecture_____

Photocopy for class_____

Transparencies_____

Homework reading_____

Other_____

2. What were your impressions about the module while teaching it?

3. What was the student response to the module content?

4. What do you think the students got out of the module?

5. Did the students fail to understand any parts of the module? If so, which part(s)?

6. How useful were the problems? Any suggestions?

7. Do you have any suggestions on the field test process?

C. Please circle the number expressing your agreement or disagreement and comment where appropriate.

		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.	In general I find this module interesting.	1	2	3	4	5
2.	The objectives of each section are clear.	1	2	3	4	5
3.	The section objectives are generally met. Comments?	1	2	3	4	5
4.	Topics are presented in a logical sequence. Comments?	1	2	3	4	5
5.	The information in the module is accurate. Comments?	1	2	3	4	5
6.	The key terms and concepts are adequately defined. Comments?	1	2	3	4	5
7.	Topics are discussed clearly. Comments?	1	2	3	4	5
8.	The module is too difficult for my students. Comments?	1	2	3	4	5
9.	The module is too easy for my students. Comments?	1	2	3	4	5

		Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
10.	The module is consistent with my students' educational background. Comments?	1	2	3	4	5
11.	The module is relevant to my students' information needs. Comments?	1	2	3	4	5
12.	The module is relevant to the courses I teach. Comments?	1	2	3	4	5
3.	The module is too long to teach in three class periods. Comments?	1	2	3	4	5
14.	The module is too short to teach for three class periods. Comments?	1	2	3	4	5
15.	The level of detail is appropriate. Comments?	1	2	3	4	5
16.	The module restricts my teaching style. Comments?	1	2	3	4	5
17.	The module is visually appealing. Comments?	1	2	3	4	5

D. Does this module meet the following original project criteria? Please check boxes at right and comment below.

Transportation Module Criteria

The modules will:

	YES	UNDECIDED	NO
1. Fit a cross-section of existing undergraduate courses.			
2. Be adaptable to varied class schedules.			
3. Be concept-oriented.			
4. Ensure low-cost reproduction and use.			
5. Be designed for use by faculty.			
6. Allow for effective use by teachers unfamiliar with module content.			
7. Be self-contained teaching units.			
8. Stimulate interest in new transportation methods.			

COMMENTS.

E. Please respond to the following questions. Feel free to attach additional sheets if desired.

1. Is the module relevant to the content of the courses you teach?

2. How could the module be modified to make it more compatible with the courses you teach?

3. What information is not in the module which should be included?

4. What information currently included in the module should be omitted?

5. How well does the professor's introduction prepare you to use the module? Should any information be added or deleted?

6. What would you tell a colleague who planned to use this module?

7. What do you like or dislike about the format of the module text?

8-10. How well does the general introduction lead in to this module? Should any information be added or deleted?

11. Were any of the questions ambiguous? (Please list their numbers.)

12. Please summarize your overall reaction to this module.

Appendix E

Conferences and Presentations of Project Team in Development of Diffusion/Adoption Plan

Appendix E - Conferences and Presentations of Project Team in Development of Diffusion/Adoption Plan

Conferences

Jan 1986 Transportation Research Board Annual Meeting. Washington, DC.

Dec 1985 Innovative Financing for Transportation: Practical Solutions and Experiences; USDOT & UVA. Fredericksburg, VA.

Jan 1985 Transportation Research Board Annual Meeting. Washington, DC.

Oct 1984 Williamsburg Conference on Surface Transportation Education and Training. Williamsburg, VA.

Presentations

Apr 1986 "New Content for Transportation Education: Transferring Research Knowledge to the Classroom"; Annual Meeting of the International Technology Education Association. Kansas City.

Jan 1986 "New Content for the New Transportation Professional: The UMTA/WVU Transportation Education Project"; The Annual Meeting of the Transportation Research Board. Washington, DC.

Jan 1985 "The Transportation Education Project at West Virginia University"; The Annual Meeting of the Education Committee of the Transportation Research Board. Washington, DC

Appendix F

Field Review Questionnaire
for Diffusion/Adoption Plan

FIELD REVIEW AND EVALUATION QUESTIONS

A. Please circle the number indicating your agreement or disagreeement and comment where appropriate.

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. The diffusion/adoption plan is consistent with the results of diffusion research. Comments?	1	2	3	4	5
2. The d/a plan and its rationale are difficult to understand. Comments?	1	2	3	4	5
3. The plan sections are presented in a logical sequence. Comments?	1	2	3	4	5
4. The objectives of the plan are clear. Comments?	1	2	3	4	5
5. Key terms and concepts are adequately defined. Comments?	1	2	3	4	5
6. The plan is based on a realistic description of transportation educators. Comments?	1	2	3	4	5
7. The level of detail in the plan is appropriate. Comments?	1	2	3	4	5

B. Please respond to the following questions. Attach additional sheets if you wish.

1. What do you like or dislike about the format of the plan?

2. Do the plan's tactics seem appropriate for UMTA to use in diffusing instructional materials to transportation educators? Why or why not?

3. Do the plan's tactics seem cost-effective? Why or why not?

4. What information not in the plan should be included?

5. What information in the plan should be omitted?

6. How can the plan be improved?

7. What would you tell a person who intended to implement this plan?

8. Do you think this plan can be tested in the field? If so, how? If not, what do you perceive as problems?

9. Summarize your overall reaction to the d/a plan.